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10/664,503	09/17/2003	Paul Taichiang Yu	GP-302212	4683

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EXAMINER

AKRAM, IMRAN

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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/664,503
Filing Date: September 17, 2003
Appellant(s): YU ET AL.

John A. Miller
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed 3/30/09 appealing from the Office action mailed 10/29/08.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

No amendment after final has been filed.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

2002/0168307 A1	Seaba	11-2002
2004/0089438 A1	Valensa	5-2004
5221524	Eguchi	6-1993

4288346

Hunter

9-1981

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claims 1, 3-10, 20, 21, and 23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba (US 2002/0168307 A1).

Regarding claim 1, Seaba discloses a water-gas shift reactor system comprising: a first stage water-gas shift reactor 42 receiving a reformat gas, said first stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25); a heat exchanger 46 receiving the reformat gas from the first stage reactor, said heat exchanger cooling the reformat gas (paragraph 25), said heat exchanger including a catalyst 46A that converts carbon monoxide and water to carbon dioxide and hydrogen (Table II), said first stage water-gas shift reactor being coupled to an inlet end of the heat exchanger by a first connector (see figure 1); and a second stage water-gas shift reactor 50 receiving the cooled reformat gas from the heat exchanger, said second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (paragraph 25), said second stage water-gas shift reactor being coupled to an outlet end of the heat exchanger by a second connector (see figure 1). Seaba does not disclose, however, that the components are integral. This is a well-known means in the art to increase heat efficiency, however. It would have been obvious to one having ordinary skill in the art at the time of invention to make integral the shift reactors and heat exchanger of Seaba as

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the shift reactors surround the heat exchanger and integrating them would afford the invention better thermal efficiency. See MPEP 2144.04 V B.

Regarding claim 3, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

Regarding claims 4 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Regarding claims 4 and 8-10, Seaba discloses the use of water in the heat exchangers (paragraph 25). Seaba does not, however, disclose the shift reactors to operate between the temperatures of 300 and 400 degrees Celsius. Seaba discloses varying temperatures and ranges for optimal conditions (paragraph 34), though, and so it would have been obvious to one having ordinary skill in the art at the time of invention to modify the device of Seaba to operate at whatever temperatures appropriate for maximum efficiency of hydrogen production--the most desirable feature in the reforming art. Optimization of parameters such as temperature is a well-known, obvious modification to a device: See MPEP 2144.05 II A.

Regarding claim 5, Seaba discloses that the first stage reactor is a high temperature reactor operating at 450°C and the second stage reactor is a low temperature reactor operating at 250°C (see figure 2).

Regarding claim 6, Seaba discloses that the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (see figure 1).

Regarding claim 7, Seaba discloses that the water-gas shift reactor system is positioned between a primary reactor 34 and a preferential oxidation 60 reactor in the fuel processing system (see figure 1).

Regarding claim 20, Seaba discloses a fuel processing system for producing a hydrogen reformate gas, said system comprising: a primary reactor 34, said primary reactor receiving a liquid hydrocarbon fuel and generating a reformate gas including hydrogen and carbon monoxide (paragraph 24); a first heat exchanger 38, said first heat exchanger receiving the reformate gas from the primary reactor and cooling the reformate gas (paragraph 25); a water-gas shift reactor assembly including a first stage water-gas shift reactor 42 receiving the cooled reformate gas from the first heat exchanger, a second heat exchanger 46 receiving the reformate gas from the first stage reactor, said second heat exchanger cooling the reformate gas, and a second stage water-gas shift reactor 50 receiving the cooled reformate gas from the second heat exchanger (paragraph 25), each of the first stage reactor, second heat exchanger and second stage reactor including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II); a third heat exchanger 54, said third heat exchanger receiving the reformate gas from the second stage reactor and cooling the reformate gas (paragraph 25); and a preferential oxidation reactor 60, said preferential oxidation reactor receiving the cooled reformate gas from the third heat exchanger, said preferential oxidation reactor including a catalyst that selectively oxidizes carbon monoxide to carbon dioxide in the reformate gas (see Table II).

Regarding claim 21, Seaba discloses that the first heat exchanger includes a catalyst 38A that converts carbon monoxide and water to carbon dioxide and hydrogen (see Table II).

Regarding claim 23, Seaba discloses the catalysts to be either precious metals Pt and/or Pd and CuO (see Table II).

Claims 2 and 22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Seaba as applied to claims 1 and 20, respectively, above, and further in view of Valensa (US 2004/0089438 A1) and appellant's admitted prior art.

While Seaba discloses heat exchangers with plates and tubes of various configurations (see figures 3), Seaba does not disclose the heat exchanger to be a tube and fin heat exchanger or a bar and plate heat exchanger. Appellant admits these types of heat exchangers to be well known in the prior art (paragraph 28 of specification), however, and Valensa is one such example. Valensa discloses an invention for a heat exchanger for reforming as a bar-plate combination (paragraph 49) and a tube-fin combination (paragraph 50). It would have been obvious to one having ordinary skill in the art at the time of invention to form the heat exchangers of Seaba in the configuration of Valensa to increase heat exchange efficiency as these types of heat exchangers are admittedly known in the art.

Claims 1,4-6, and 8-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Eguchi (US 5,221,524) in view of Hunter (US 4,288,346).

Regarding claim 1, Eguchi discloses a water-gas shift reactor system (Fig. 3A) comprising: a first stage water-gas shift reactor 1a receiving a reformat gas, said first

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stage reactor including a catalyst 2a that converts carbon monoxide and water to carbon dioxide and hydrogen, said first stage water-gas shift reactor being coupled to an inlet end of the heat exchanger by a first connector (see figure 3A); a heat exchanger 5 receiving the reformat gas from the first stage reactor; and a second stage water-gas shift reactor 7 receiving the cooled reformat gas from the heat exchanger, said second stage reactor including a catalyst 8 that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 3A, CI/L35-65), said second stage water-gas shift reactor being coupled to an outlet end of the heat exchanger by a second connector (see figure 3A), but does not explicitly disclose said heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and-hydrogen.

Hunter discloses a heat exchanger including a catalyst that converts carbon monoxide and water to carbon dioxide and hydrogen (Fig. 2, C6/L50-68), and it would have been obvious to one of ordinary skill in the art at the time of the invention to modify Eguchi with Hunter for the purpose to provide a catalytic heat exchanger wherein a rapid subtraction of heat is required to improve energy efficiency (CI/L1-C2/L4).

Neither Eguchi nor Hunter disclose, however, that the components are integral. This is a well-known means in the art to increase heat efficiency, however. It would have been obvious to one having ordinary skill in the art at the time of invention to make integral the shift reactors and heat exchanger of Eguchi as the shift reactors surround the heat exchanger and integrating them would afford the invention better thermal efficiency. See MPEP 2144.04 V B.

Regarding claims 4, 5 and 8-10, the recitations with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus. See Ex parte Masham, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987).

Regarding claim 6, Eguchi discloses the water-gas shift reactor system is part of a fuel processing system for producing hydrogen for a fuel cell (Fig. 3A, CI/L35-65).

(10) Response to Argument

Appellant argues on pages 7 and 8 of the Appeal Brief that the invention as claimed "provides more than merely a design choice and provides significant advantages." Appellant then continues to provide examples of such advantages and goes on to say that the heat exchanger and water gas shift reactor of Seaba "just don't snap together."

Examiner refutes these arguments for the following reasons: Firstly, in the rejection of independent claims 1 and 20, motivation is provided for making the components of Seaba integral: better thermal efficiency. The fact that appellant has recognized another advantage which would flow naturally from following the suggestion of the prior art cannot be the basis for patentability when the differences would otherwise be obvious. See *Ex parte Obiaya*, 227 USPQ 58, 60 (Bd. Pat. App. & Inter. 1985). Second, the modification of Seaba is in light and practice of one having ordinary skill in the art. When making Seaba integral, components are not simply "snapped" together, but modified in a manner consistent with that of ordinary skill. Connections

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would be adapted and parts integrated in a manner that would yield the well-known advantages of making the components integral.

In regards to the dependent claims 3-10, 21, and 23 over Seaba, all arguments presented are in light of the supposed deficiencies of the rejection of the independent claims. All rejections are upheld.

In regards to the dependent claims 2 and 22 over Seaba in view of Valensa and appellants admitted prior art, all arguments presented are in light of the supposed deficiencies of the rejection of the independent claims. All rejections are upheld.

Appellant argues on pages 9 and 10 of the Appeal Brief that, much like the supposed deficiencies in the rejection over Seaba, neither Eguchi nor Hunter disclose claimed integral components. As the arguments for Eguchi and Hunter are related to Seaba, so too is the response to arguments: namely, that the Examiner has provided motivation to make the units of Eguchi and Hunter integral and modification would be consistent with one having ordinary skill in the art.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

Imran Akram

/Imran Akram/

Examiner, Art Unit 1795

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